REMARKS

Applicants appreciate the thorough examination of the present application, as evidenced by the final Official Action. Applicants also appreciate the courtesies extended by the Examiner during the recent telephone interview. The final Official Action continues to reject all of the claims, namely Claims 1-27, under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,381,586 to Glasserman et al., in view of U.S. Patent No. 6,157,918 to Shepherd, and further in view of U.S. Patent No. 6,061,662 to Makivic. The final Official Action also continues to reject all of the claims under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention. Further, the final Official Action continues to reject Claims 19-27 under 35 U.S.C. § 101 for failing to describe a "concrete, useful and tangible output."

In view of the final Official Action, Claims 19-27 have been amended to more clearly recite a computer program product that produces a "concrete, useful and tangible output." As explained more fully below, however, none of the cited references, taken individually or in combination, teach or suggest the claimed invention of Claims 1-27. As also explained more fully below, Applicants respectfully submit that all of the claims do particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Applicants therefore respectfully traverse the rejections of the claims under §§ 103(a) and 112, second paragraph. In addition to the amendments to Claims 19-27, equation (1) in the specification of the present application has been amended to correct an inadvertent typographical error. More particularly, equation (1) in the specification has been amended to move the closing parenthesis in the maximum expression to correctly identify the arguments of that expression.

A. Claims 19-27 Comply with 35 U.S.C. § 101

As indicated above, the final Official Action continues to reject Claims 19-27 under 35 U.S.C. § 101 for failing to describe a "concrete, useful and tangible output." As such, to more clearly recite a computer program product that produces a "concrete, useful and tangible output," Claims 19-27 have been amended to recite a computer program product for performing a method of valuing a contingent claim. More particularly, as suggested by the Examiner during the recent telephone interview, Claims 19-27 been amended to recite a computer program product for

performing a method of valuing a contingent claim. The computer program product includes a computer-readable storage medium having computer-readable program code portions stored therein for performing the method.

Consistent with independent Claim 1, the method of performed by the computer program product recited in independent Claim 19 includes determining a present value distribution of contingent future benefits attributable to the exercise of the contingent claim at a subsequent time, where determining the present value distribution includes discounting a distribution of contingent future benefits according to a first discount rate. The method performed by the computer program product also includes determining a present value of a contingent future investment required to exercise the contingent claim at the subsequent time, where the present value of the contingent future investment is determined based upon a second discount rate that need not equal the first discount rate. Thereafter, the value of the contingent claim is determined based upon the present value distribution of contingent future benefits and the present value of the contingent future investment.

As explained in response to the first Official Action, Applicants note that, consistent with the definition of statutory subject matter in M.P.E.P. § 2106, Claims 19-27 recite computer a program product including readable storage medium having computer-readable program code portions stored therein for performing the method of valuing a contingent claim. Applicants also note that as much as the claims at issue in *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368, 1373 (Fed. Cir. 1998), Claims 19-27 recite a computer program product that produces a "useful, concrete and tangible result." In *State Street*, the claims at issue were drawn to a system for permitting an administrator to monitor and record the flow of financial information and make all necessary calculations for maintaining a partner fund financial services configuration. 149 F.3d at 1371. In holding that the claimed system at issue in *State Street* was patentable subject matter, the court stated, "the transformation of data, representing discrete dollar amounts, by a machine through a series of mathematical calculations into a final share price, constitutes a practical application of a mathematical algorithm, formula or calculation, because it produces 'a useful, concrete and tangible result' – a final share price momentarily fixed for recording and reporting purposes ...." *Id.* at 1373.

Similar to the claimed subject matter at issue in *State Street*, the computer program product of Claims 19-27 perform a method that includes determining the value of a contingent claim. Such a value, then, can be used in contexts, such as in financial determinations and project evaluations, to determine whether to exercise the contingent claim, such as by further investing in a project. As such, the value of the contingent claim can be considered to be a "useful, concrete and tangible result" of the claimed computer program product. Applicants therefore respectfully submit Claims 19-27 recites statutory subject matter, as required by 35 U.S.C. § 101. Applicants therefore respectfully submit that the rejection of Claims 19-27 under § 101 is overcome.

B. The Claims Comply with 35 U.S.C. § 112, Second Paragraph

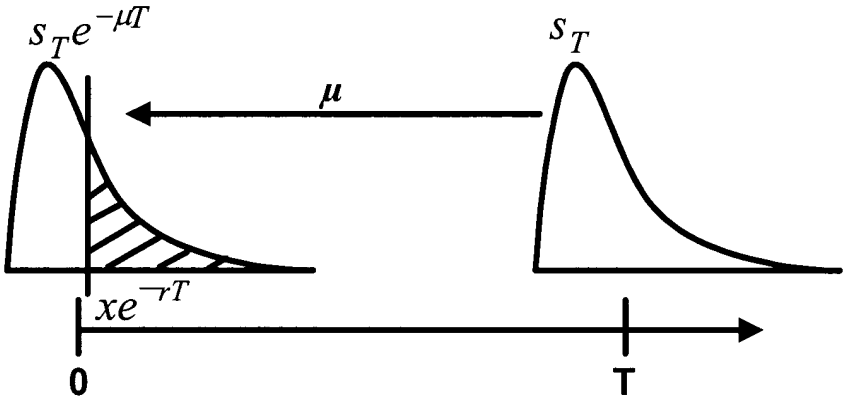
As indicated above, the final Official Action rejected all of the claims under 35 U.S.C. § 112, second paragraph, as failing to set forth the subject matter which Applicants regard as the invention. More particularly, the Official Action indicated that Applicants are requested to present the defining equations, conditions and assumptions in the model formulation, along with the derivations, in sufficient detail so that one of ordinary skill in the art can evaluate the model. Applicants respectfully submit that the current set of claims do, in fact, set forth the subject matter which Applicants regard as the invention.

Applicants note that the final Official Action requested that Applicants present the defining equations, conditions, assumptions in the model formulation, and the derivations, in sufficient detail such that one of ordinary skill in the art can evaluate the model. Applicants submit, however, that the specification does include model equations, conditions, assumptions and derivations in sufficient detail to enable one skilled in the art to practice the claimed invention. For example, as described on page 15 of the present application, the valuation of a contingent claim according to the present invention can be represented as given in the following equation (1):

$$E[\max(s_T e^{-\mu T} - x e^{-rT}, 0)]$$

where s_T is the random value of the asset at the time (T) the contingent claim may be exercised time, μ is the first discount rate (e.g., WACC), x is the contingent future investment, r is the second discount rate (e.g., risk free rate).

The derivation of this equation is depicted by the figures and described by the text of the application. For example, shown below is a representation of FIG. 2 of the present application that includes a representation of the present value of a contingent future investment to graphically illustrate an application of equation (1). As shown on the right-hand side of the figure below, s_T can be represented by the distribution of contingent future benefits at time T, and as shown on the left-hand side, $s_T e^{-\mu T}$ represents the present value distribution of contingent future benefits at time zero (s_T having been discounted by the first discount rate μ) (see block 10 of FIG. 1 of the present application).



Similarly, as shown, xe^{-rT} represents the present value of a contingent future investment (see block 12 of FIG. 1). Implementing equation (1), then, the value of the contingent claim can be determined by subtracting xe^{-rT} from $s_T e^{-\mu T}$ (i.e., $s_T e^{-\mu T} - xe^{-rT}$). However, because potential loss is a possible outcome when the contingent claim is exercised, equation (1) limits the value of the contingent claim to instances in which the contingent claim has a value at least equal to zero. Thus, as determined by equation (1), the value of the contingent claim is related to the shaded region ($s_T e^{-\mu T} - xe^{-rT}$) of the figure shown above. Presented in a reverse cumulative format, FIG. 3 of the present application illustrates the distribution resulting from the maximum of $s_T e^{-\mu T} - xe^{-rT}$ and zero. The value of the contingent claim, then, can be shown to equal $E[\max(s_T e^{-\mu T} - xe^{-rT}, 0)]$ (see block 14 of FIG. 1).

As explained during the telephone interview, it is well known that cashflows are discounted using rates related to underlying risk. For example, net present value can be determined by discounting expected future recurring profits at a discount rate, μ, and discounting

the future guaranteed investment at the risk free rate. In notational terms, then, net present value can be determined as follows:

$$NPV = E[s_T]e^{-\mu T} - xe^{-rT}$$

Techniques such as net present value, however, do not capture the optionality of a discretionary investment. To capture the option value (value of a contingent claim), as shown in equation (1), the claimed invention creates a present value distribution by discounting a distribution of profits (benefits) at μ, and discounts discretionary investment at a second rate (e.g., risk-free rate). The maximum function (i.e., $\max(s_T e^{-\mu T} - xe^{-rT}, 0)$) can then be applied before the expected payoff is calculated. And by discounting the whole distribution (s_T), then calculating the expectation (after the max operation), embodiments of the present invention are capable of capturing the optionality evaluated by Black-Scholes, but in a more transparent and accessible manner with fewer restrictive assumptions.

Thus, as shown in the figures and described in the specification, the present application does, in fact, include model equations, conditions, assumptions and derivations in sufficient detail to enable one skilled in the art to practice the claimed invention. Applicants respectfully submit, then, that the current set of claims set forth the subject matter which Applicants regard as the invention, as required by 35 U.S.C. § 112, second paragraph. Applicants also respectfully submit that the rejection of the claims under § 112, second paragraph is therefore overcome.

C. The Claims are Patentably Distinct from the Cited References

As further indicated above, final Official Action continues to reject Claims 1-27, under 35 U.S.C. § 103(a) as being unpatentable over the Glasserman patent, in view of the Shepherd patent, and further in view of the Makivic patent. As explained in response to the first Official Action, the Glasserman patent discloses a method of pricing derivative securities by selecting an importance sampling distribution and combining the importance sampling distribution with stratification or Quasi-Monte Carlo (QMC) simulation. As disclosed, the Glasserman provides a more efficient Monte Carlo technique from which option prices can be estimated. In this regard, the Glasserman patent provides a number of numerical examples of pricing options according to a risk-neutral valuation approach that defines a risk-free interest rate, r or r_0. In the examples,

the pricing options method according to the Glasserman patent are shown to be more efficient than traditional Monte Carlo methods.

As also explained in response to the first Official Action, the Makivic patent discloses a Monte Carlo system and method for pricing financial instruments. In this regard, Monte Carlo methods in financial calculations can be based on the risk-neutral valuation approach, which defines the expected return on the financial instrument to equal the risk-free interest rate. Col. 4, lines 31-34; and col. 10, lines 25-27. As disclosed, a path-integral approach is disclosed that relies upon a probability distribution of the complete paths (histories) of a financial instrument. If statistical error is below a desired level of accuracy, Monte Carlo estimates are computed. Then, a Monte Carlo estimate of the option price can be obtained. See col. 5, lines 55-58; col. 6, lines 23-25; and col. 6, line 59 – col. 7, line 1.

The Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts. As disclosed, an ordering party inputs contract data relating to a phenomenon that has a range of future outcomes and a future time of maturity. The contract data comprises a number of probabilities of occurrence for each future outcome, and a consideration due a counterparty at or after the time of matching a contract with a counterparty. A counterparty inputs registering data that includes a set of probabilities of occurrence for each outcome in the range. A data processing means prices and matches a contract for the phenomenon from the contract data and registering data. Shepherd '918 Abstract.

None of the Glasserman, Makivic and Shepherd patents, however, individually or in combination, teach or suggest determining a present value distribution of contingent future benefits, as recited by the claimed invention of independent Claims 1, 10 and 19. In fact, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest any present value distribution, whether of contingent future benefits or otherwise. Also, none of the Glasserman, Makivic and Shepherd patents, individually or in combination, teach or suggest determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate used to determine a present value distribution of contingent future benefits, as also recited in independent Claims 1, 10 and 19.

As indicated above, the Shepherd patent discloses methods and an apparatus relating to formulation and trading of investment contracts that, while formulating and trading investment

contracts, neither teaches nor suggests a method of valuing such contracts, as recited in independent Claims 1, 10 and 19. In contrast, the Shepherd patent merely discloses that net contingent entitlement amounts are determined, without teaching or suggesting a method of determining such entitlement amounts. In contrast to the Shepherd patent, both the Glasserman and Makivic patents do disclose methods of pricing options. As indicated above, however, both the Glasserman and Makivic patents price options according to the risk-neutral approach. In this regard, neither the Glasserman patent nor the Makivic patent, individually or in combination, teach or suggest pricing options utilizing two discount rates that need not equal one another, as recited by independent Claims 1, 10 and 19. Further, in valuing options, neither the Glasserman nor the Makivic patents teach or suggest determining a present value distribution of contingent future benefits. In this regard, the Glasserman patent discloses a more efficient Monte Carlo technique with improved variance reduction through the use of Hessian matrices and Eigenvectors. The Makivic patent discloses a Monte Carlo method that computes an implied volatility, and makes the process more efficient through sampling different regions of the price path space according to the respective contributions to the payoff function.

As explained above, the Glasserman, Makivic and Shepherd patents, individually or in combination, do not teach or suggest valuing a contingent claim including determining a present value distribution of contingent future benefits with a first discount rate, or determining a present value of a contingent future investment with a second discount rate that can differ from a first discount rate, as recited in independent Claims 1, 10 and 19. Applicants therefore respectfully submit that independent Claims 1, 10 and 19 are patentably distinct from the Glasserman, Makivic and Shepherd patents, taken either individually or in combination. Applicants further respectfully submit that the rejection of independent Claims 1, 10 and 19 under 35 U.S.C. § 103(a) is overcome. And as dependent Claims 2-9, 11-18 and 20-27 depend, either directly or indirectly, from independent Claims 1, 10 and 19, respectively, Applicants also respectfully submit that the rejection of dependent Claims 2-9, 11-18 and 20-27 under 35 U.S.C. § 103(a) is overcome.

CONCLUSION

In view of the amended claims and the remarks presented above and as discussed during the interview, Applicants submit that the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicants' undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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